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NZMUGS NEW ZEALAND MODELLING USER GROUP

2020 CONFERENCE, 21st SEPTEMBER - 2nd OCTOBER, ONLINE

Ministry of Transport
TE MANATŪ WAKA

Enabling New Zealanders to flourish

The good, the bad and the ugly: understanding the reasons behind transport choices (and then doing something about them)

Prof Simon Kingham

Te Kura Aronukurangi | School of Earth & Environment, Te Whare Wānanga o Waitaha | University of Canterbury

Kaitohutohu Matua Pūtaiao | Chief Science Advisor, Te Manatū Waka | Ministry of Transport

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Context and background

- Chief Science Advisor, Ministry of Transport
  - 2 days a week
  - Secondment from UC
    - provide advice to the Ministry on areas that would benefit from scientific input
    - champions the Ministry's use of evidence throughout the policy process and its development of wider sector strategies.
- Professor of Geography, University of Canterbury
  - 3 days a week
  - Teaching and research

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Drivers of travel choice

… and can we measure and/or model them?

And if we can’t do we ignore them?

How can we include them in decision making?

It’s not all about money

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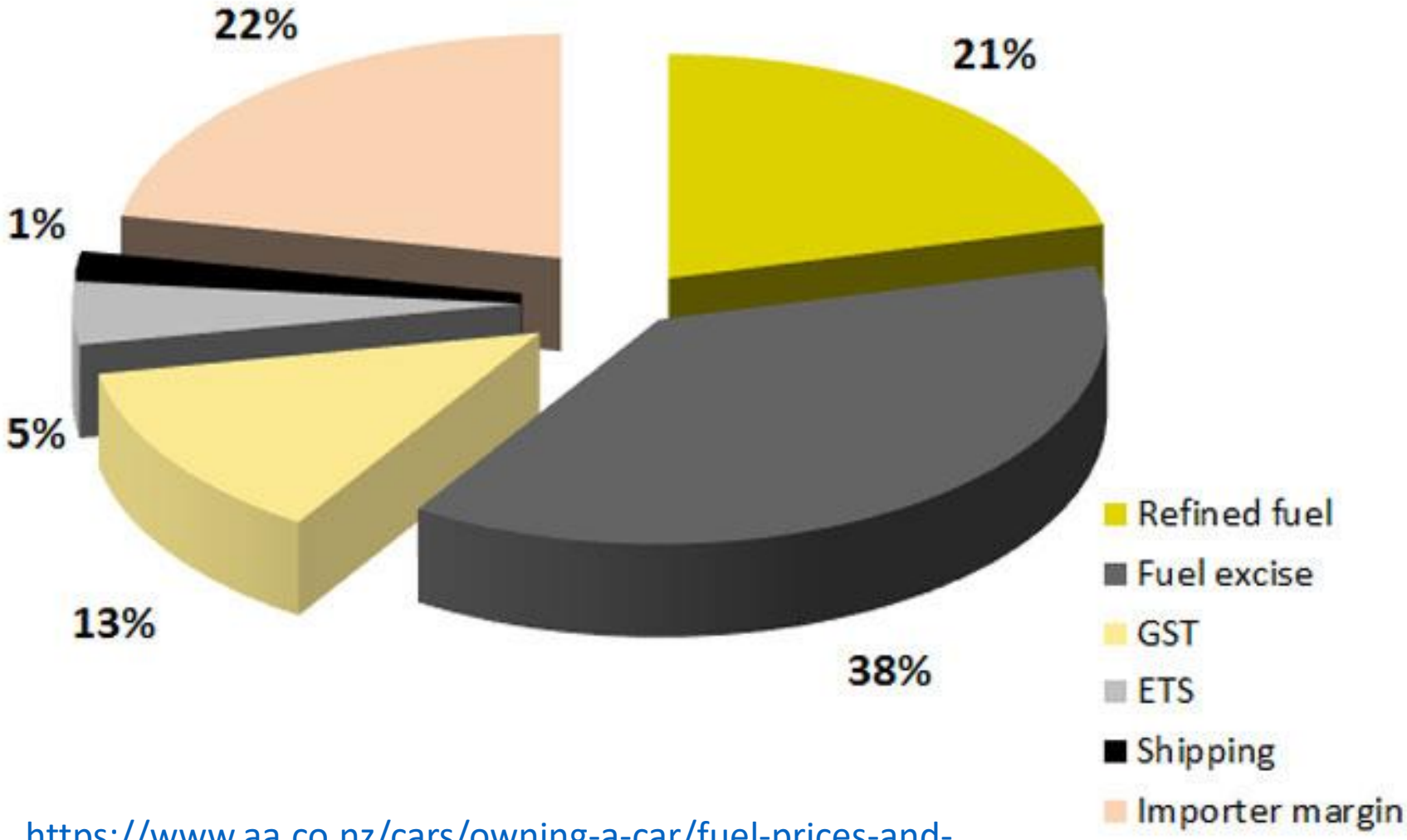
Emission Trading Scheme (ETS)

- Puts a price on greenhouse gas emissions.
- It creates a financial incentive for:
  - businesses to reduce their emissions
  - landowners to earn money by planting forests that absorb carbon dioxide as the trees grow
- For vehicle fuel, importing companies do this

Price components of a litre of petrol ($2.04)

as at 11 September 2020



https://www.aa.co.nz/cars/owning-a-car/fuel-prices-and-types/how-petrol-prices-are-calculated/

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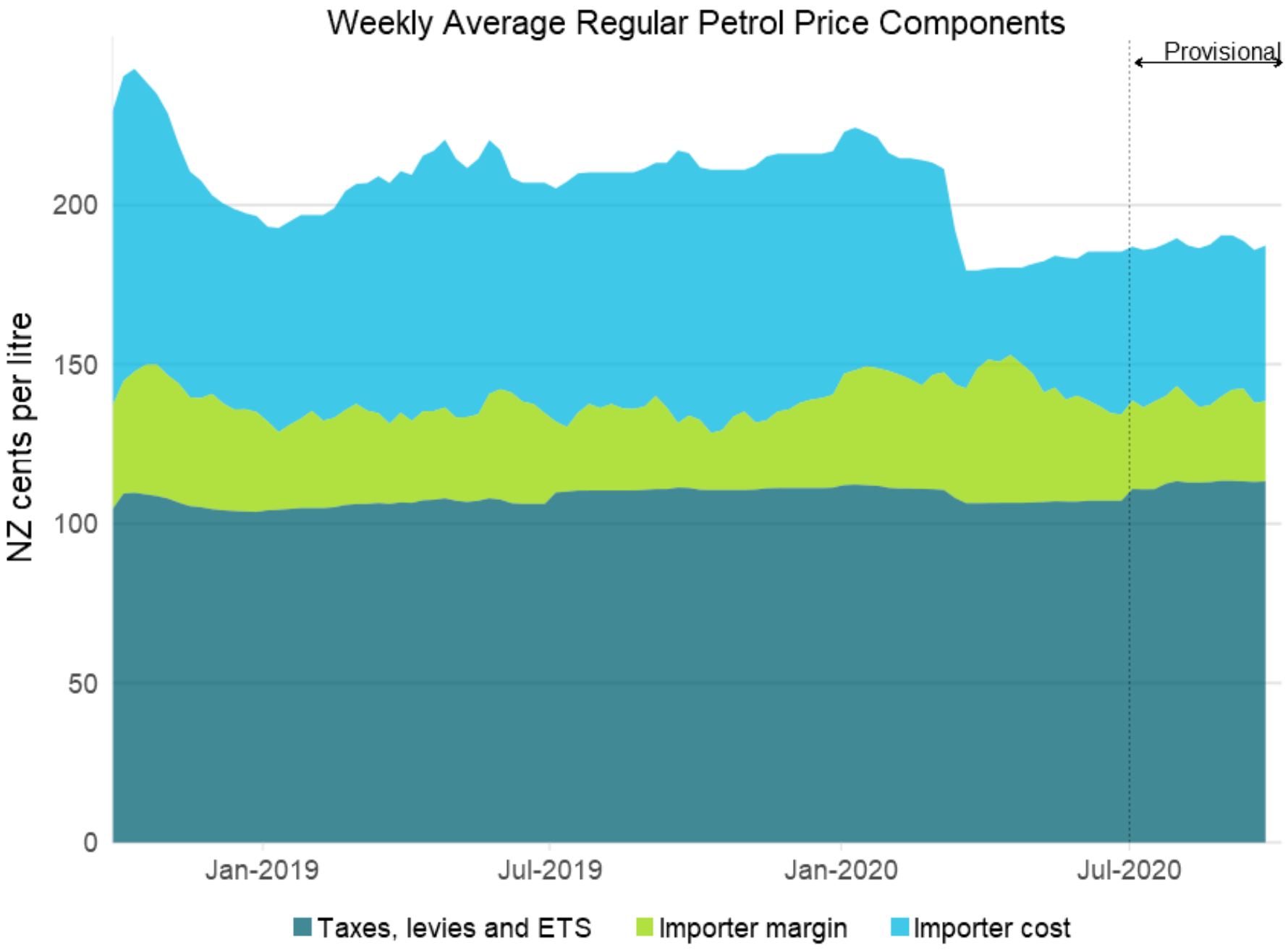
https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-statistics/weekly-fuel-price-monitoring/



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Emission Trading Scheme (ETS)

- But ….. are people that sensitive to fuel price change?

Gasoline prices tend to have little effect on demand for car travel

https://www.eia.gov/todayinenergy/detail.php?id=19191

High fuel prices lower the road toll - study

https://www.newshub.co.nz/home/new-zealand/2018/12/high-fuel-prices-lower-the-road-toll-study.html

- Options / choice are important

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People like options

- *Build it and they will come*

https://www.youtube.com/watch?v=o3c_pJ_CLJQ

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Diesel news.com.au

HOME NEWS INDUSTRY ISSUES OPINION TECH KNOW SHOWCA

Build it and They Will Come

In the midst of unprecedented events that have beset the global economy, essential services such as trucking and Australia's construction sector continue to operate, ensuring that things like freight and critical infrastructure remain up and running, build it and they will come.

https://www.dieselnews.com.au/build-it-and-they-will-come/

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CITYLAB

Why Did America Give Up on Mass Transit? (Don't Blame Cars.)

Streetcar, bus, and metro systems have been ignoring one lesson for 100 years: Service drives demand.

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https://www.bloomberg.com/news/features/2018-08-31/why-is-american-mass-transit-so-bad-it-s-a-long-story

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Build it and they will come: Auckland sees 100 million public transport trips

An investment of $2.2 billion has seen public transport in Auckland transformed. Consequently, more people than ever are using the services around the city.

https://www.intelligenttransport.com/transport-news/81589/auckland-100-million-public-transport-trips/

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Build it and they will come

Portland Oregon's experience with modest investments in bicycle transportation

By: Roger Geller, Bicycle Coordinator
City of Portland, Oregon

https://www.portlandoregon.gov/transportation/article/370893

ELSEVIER

Case Studies on Transport Policy
Volume 8, Issue 2, June 2020, Pages 672-682

Build it and give 'em bikes, and they will come: The effects of cycling infrastructure and bike-sharing system in Lisbon

Rosa Félix, Paulo Cambra, Filipe Moura

- Results show a 3.5-fold increase of cyclists after the expansion of the cycling network in the central area of the city.
- A sequent 2.5-fold increase of cyclists was observed following the implementation of an electric bike-sharing system.

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People are not liquid!

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Building to relieve congestion

First seen in 1930s

"on urban commuter expressways, peak-hour traffic congestion rises to meet maximum capacity"

Downs A, 1962, The law of peak-hour expressway congestion. Traffic Quarterly 16, 3, 393-409. https://babel.hathitrust.org/cgi/pt?id=uc1.$b3477&view=1up&seq=457

New roads generate new traffic

The Department of Transport, 1994, Trunk roads and the generation of traffic. The Standing Advisory Committee on Trunk Road Assessment. HMSO, London.

Latent demand released

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Building to relieve congestion

Congestion encourages people not to use cars, or not to travel at all

But works best with good alternatives

- dedicated PT routes
- good cycling facilities

… and reduced demand

- It works the other way

Before (http://www.kcet.org/socal/departures/landofsunshine/la-river/from-freeways-to-waterways-what-los-angeles-can-learn-from-seoul.html)

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www.lafoundation.org

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ansport

Where did the traffic go?

"It just disappeared" - Prof Jeff Kenworthy

Congestion is not all bad!

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People don’t like traffic

- Presence of traffic affects behavior

Traffic and community

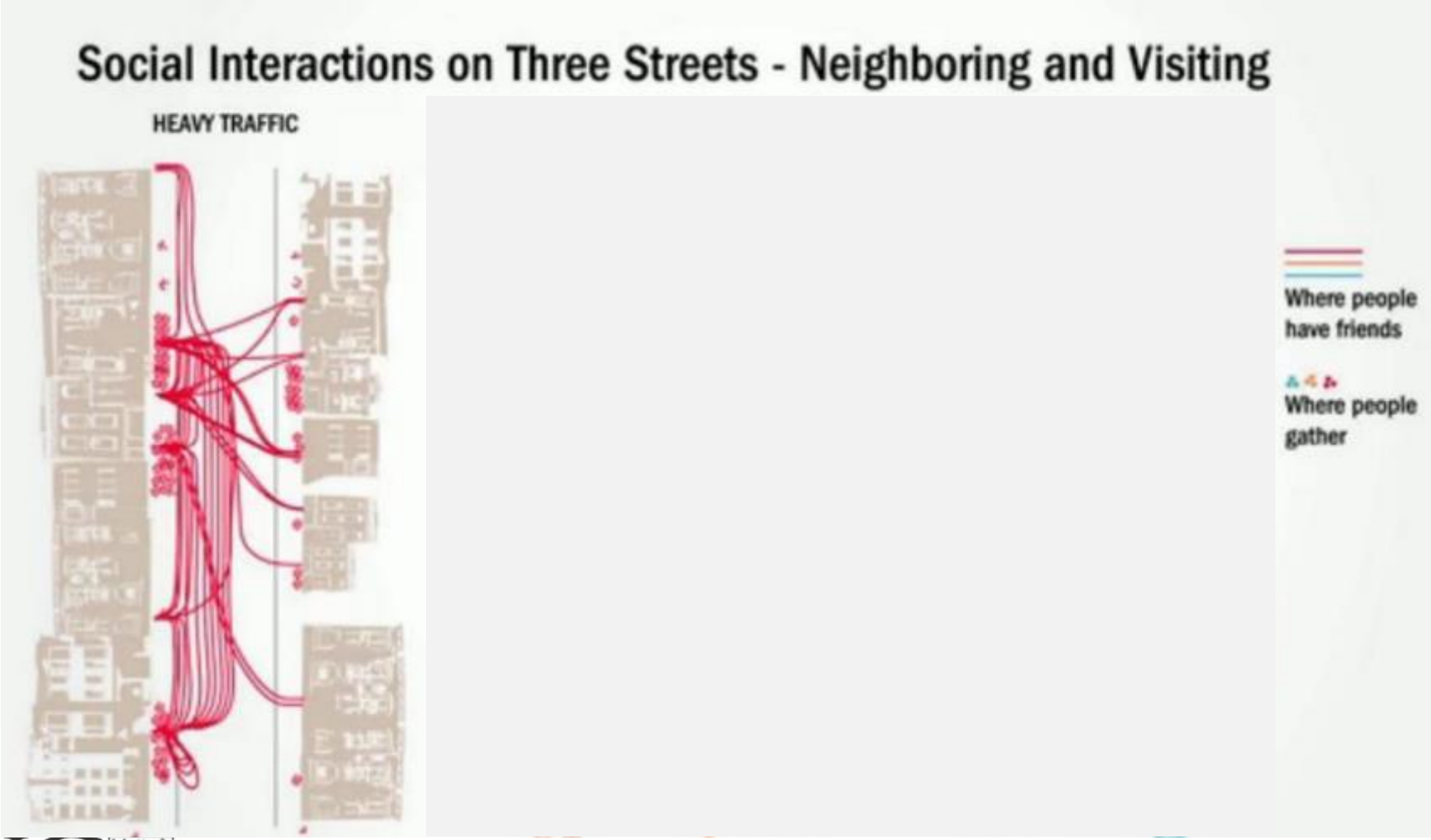
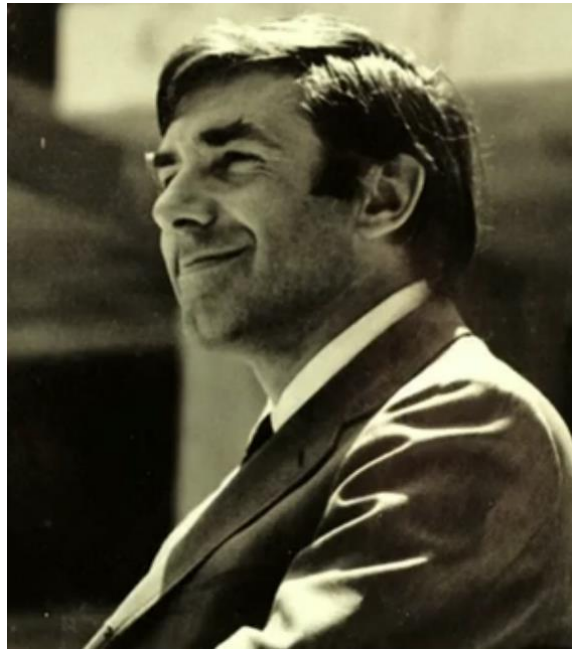


Figure 1: This image shows how community ties can actually be knit together by a street that is livable and inviting — or torn apart when auto traffic noise, pollution, and threats dominate the street environment.

*Source: Figure 3, page 21, **Livable Streets**, Donald Appleyard, University of California Press, 1981.*



Donald Appleyard

Traffic levels:
16,000, 8,000 and 2,000 vehs per day

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Re-working Appleyard in a low density environment: An exploration of the impacts of motorised traffic volume on street livability in Christchurch, New Zealand.

Wiki J., Kingham S., and Banwell K.

World Transport Policy and Practice
Volume 24.1 Mar 2018

LIGHT (< 500 vpd)

5.1 average connections

"We have great neighbours and live in a safe street"
"I enjoy talking with my neighbours"

MODERATE (1400-2500 vpd)

5.9 average connections

"Most people get out and about and talk on the street"
"Family-orientated and friendly"

HEAVY (8,400-14,000 vpd)

2.1 average connections

"My street is a car thoroughfare"
"Lived here over 35 years, a decline in people talking to neighbours and children playing"

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People like other people

– well some do !

Gathering places

- Local places of *anticipated/planned* interaction
- Places for purposeful social interaction
- Pubs, cafes, community houses, libraries (multiple use), pools, parks

"It's hard for people to engage with each other when you don't have a meeting place to come together"

Bumping places

- Local and linked to walkability
- Places of *accidental/unplanned* interaction
- Streets, primary schools, local natural greenspaces and parks, community facilities, local shops, street furniture

*The school was the only **bumping** place for Phillipstown and then the Ministry closed it…. The Ministry did not see the school as a community hub or the importance for the community*

*Schools pop up constantly as **bumping** places for mums and sometimes dads too*

*Yes **bumping** into people is so important I think is what I like and that is what I connect with*

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Bumping spaces

Vancouver (Simon Kingham)

Bumping spaces

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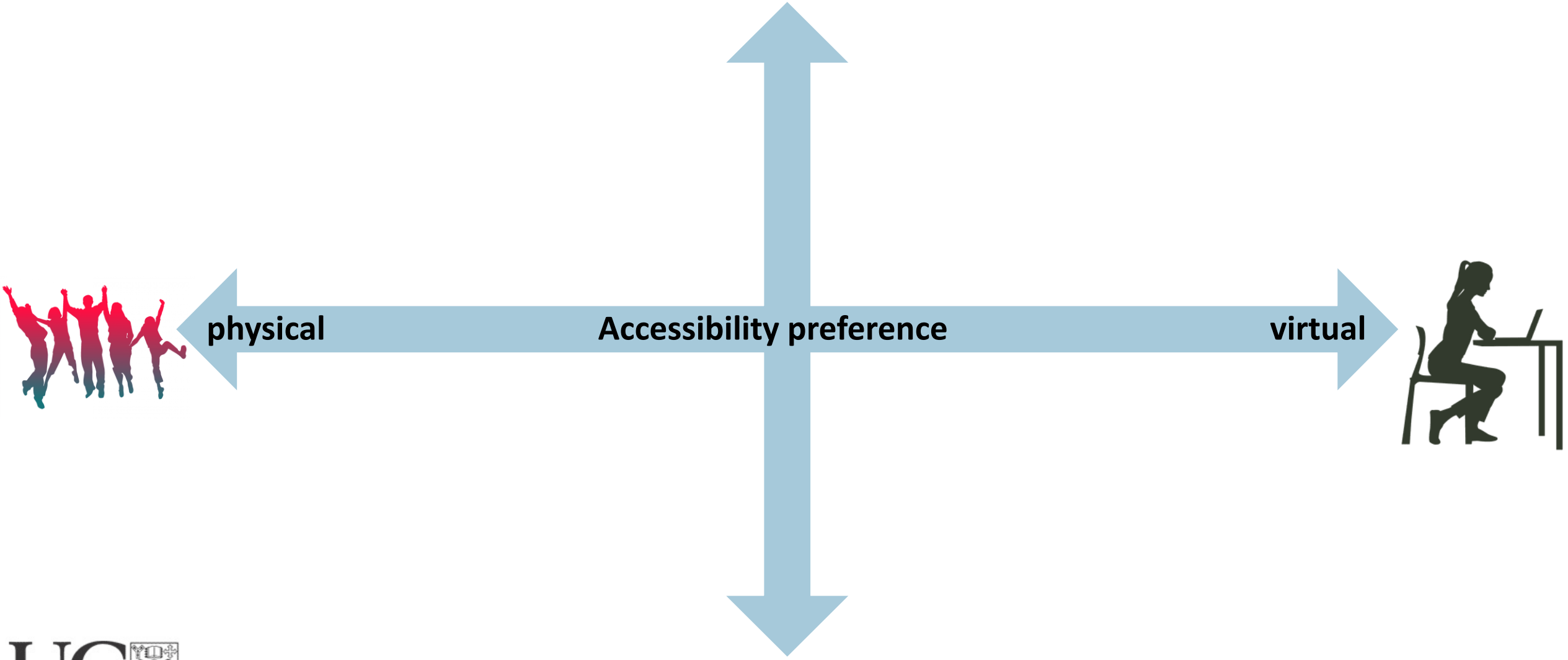
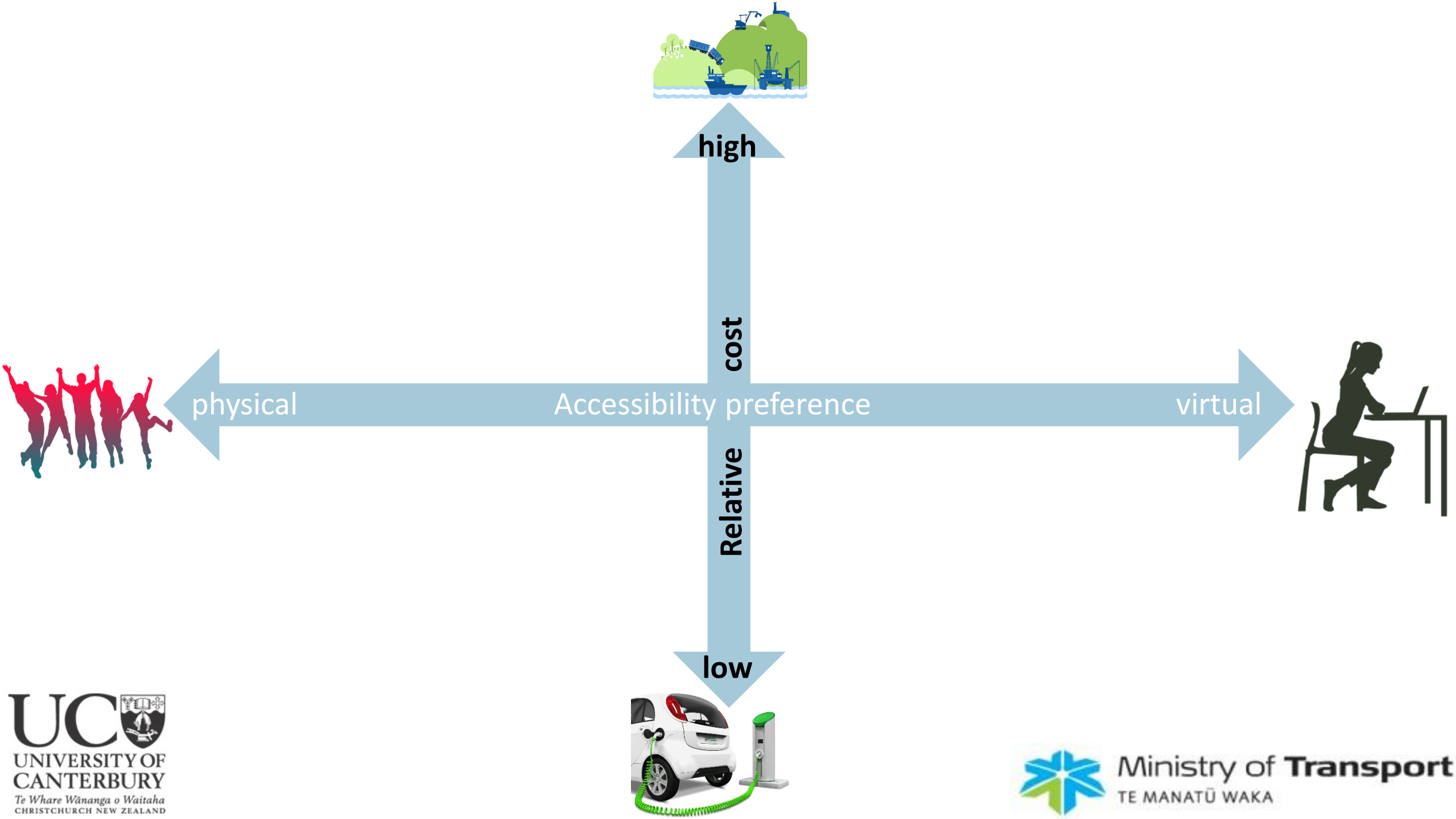
Christchurch (Alan Jamieson)



https://www.transport.govt.nz/multi-modal/keystrategiesandplans/strategic-policy-programme/future-demand/



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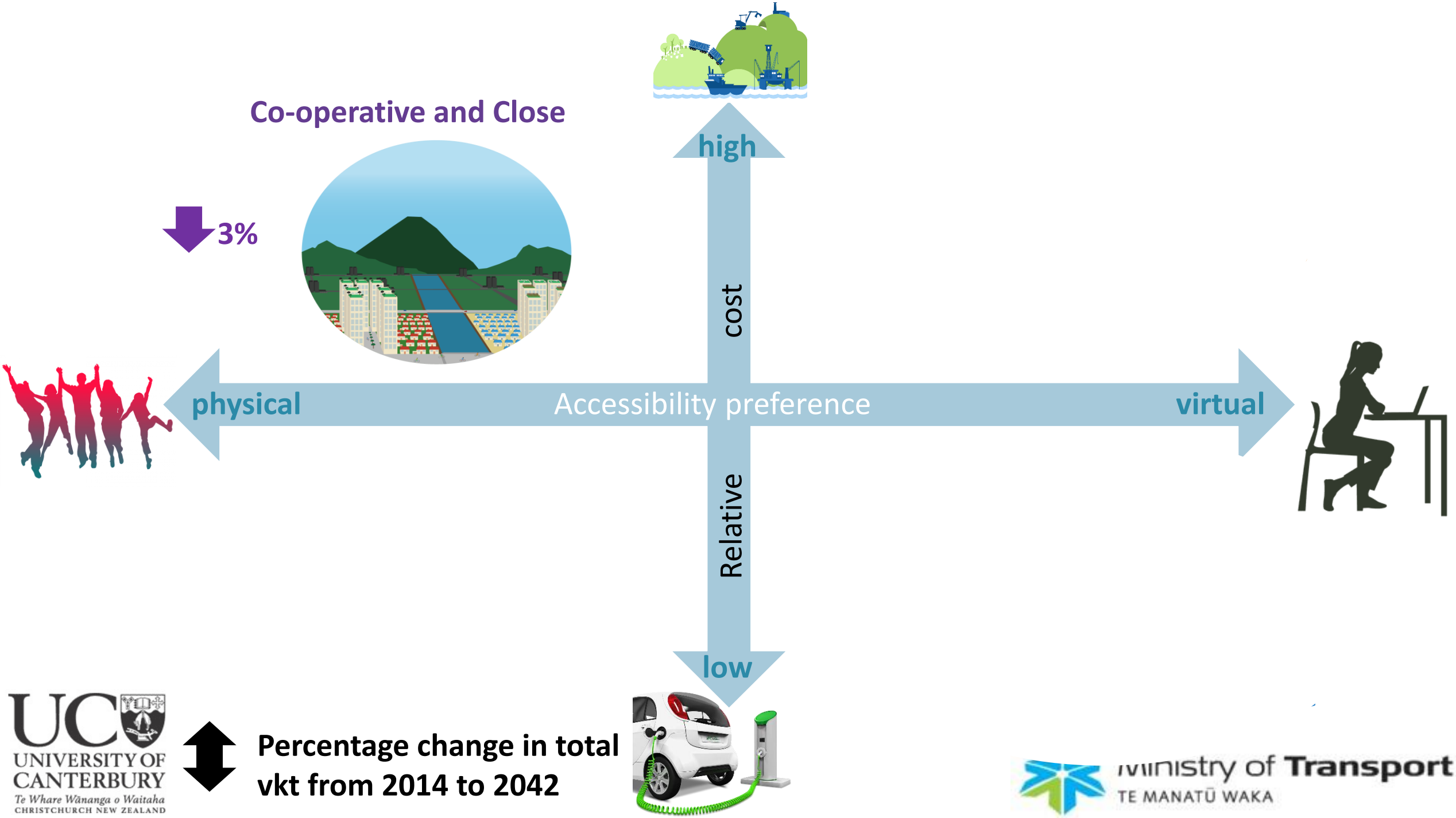
Co-operative and Close
3%
high
cost
physical
Accessibility preference
virtual
Relative
low
Percentage change in total vkt from 2014 to 2042
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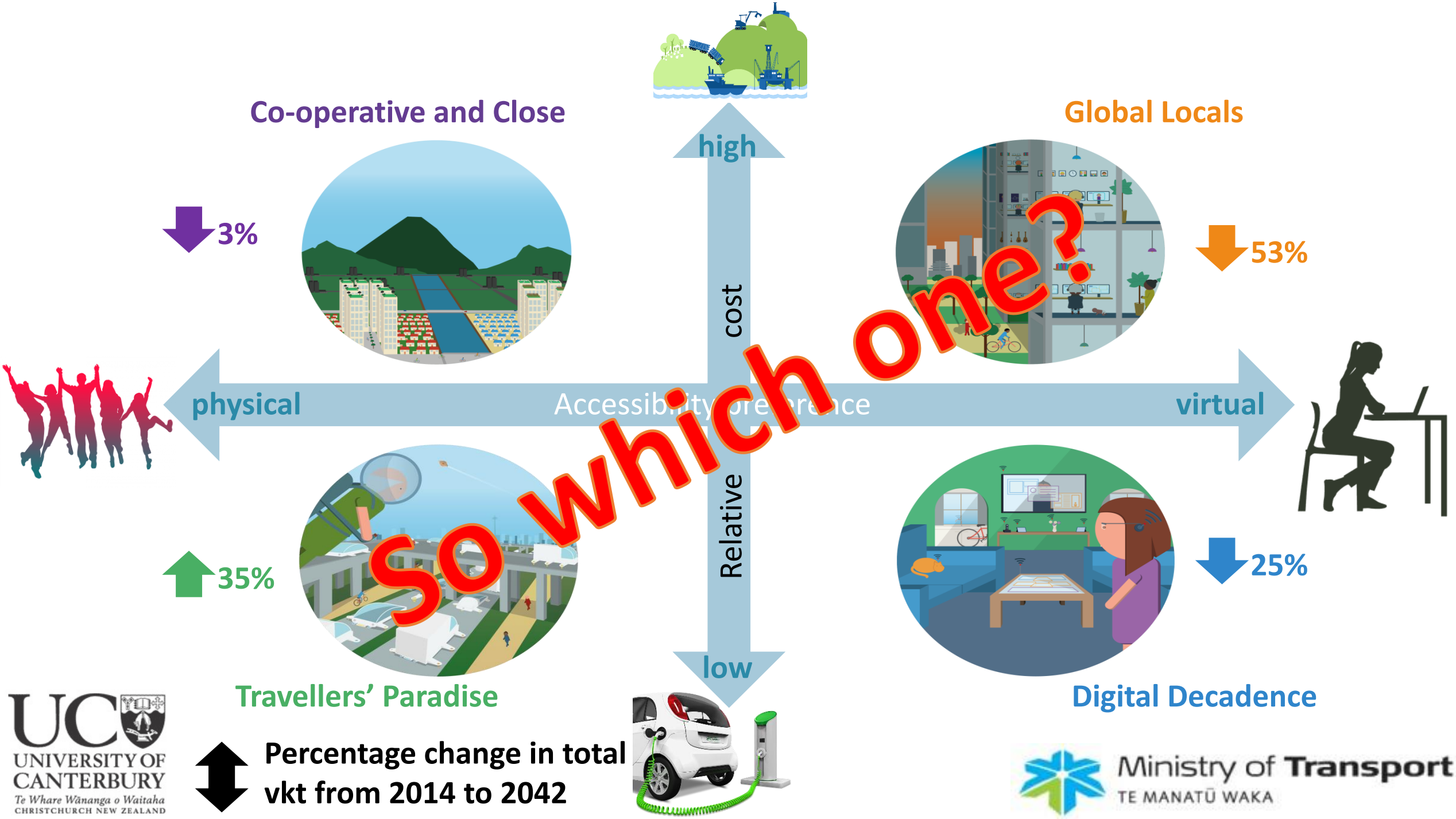
Co-operative and Close
3%
Global Locals
53%
high
cost
physical
Accessibility preference
virtual
Relative
low
35%
25%
Travellers' Paradise
Digital Decadence
Percentage change in total vkt from 2014 to 2042
So which one?
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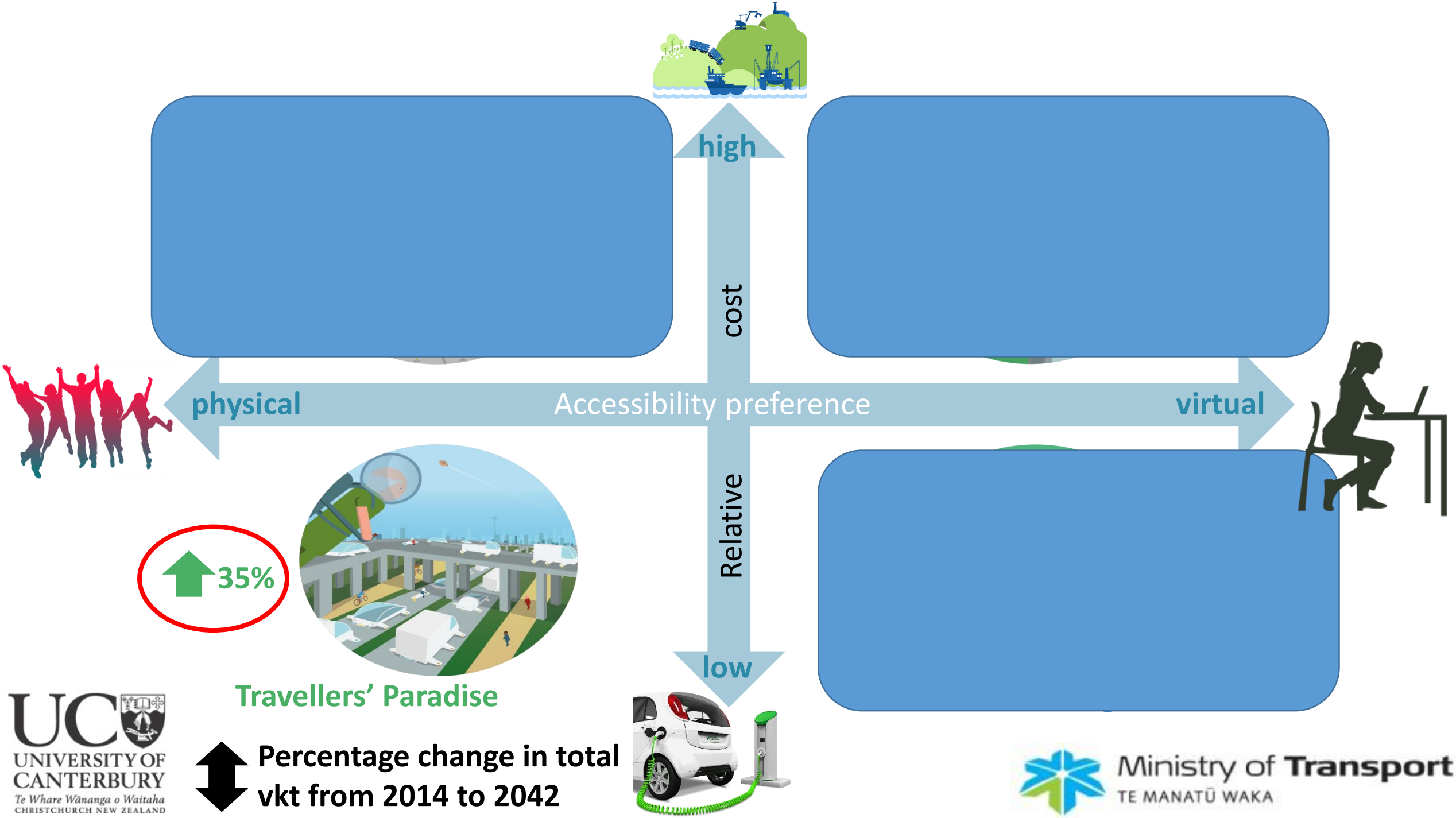
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Travellers' Paradise
Percentage change in total vkt from 2014 to 2042
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People like nice environments

Natural and green

- Intrinsic quality of place
- Personal significance
- Natural places to be alone, meander, walk the dog, meet others
- Trees as features of the local environment; noted where absent

"Hagley [park] is soul food for me, the natural place, it is my replenishing time"

"My trees, I know them by name"

"I walk by the river everyday as I do my morning perambulation that cuts through a couple of parks that are a vital part of my life"

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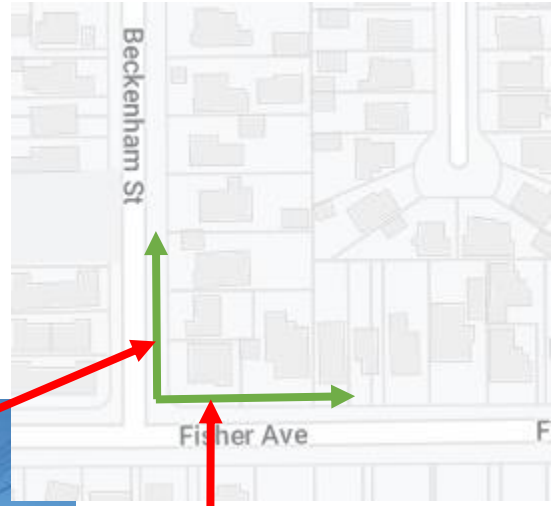
Green



Christchurch

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Pearson *et al. BMC Public Health* 2014, 14:553
http://www.biomedcentral.com/1471-2458/14/553

BMC Public Health

RESEARCH ARTICLE Open Access

Associations between neighbourhood environmental characteristics and obesity and related behaviours among adult New Zealanders

Amber L Pearson[1*], Graham Bentham[2], Peter Day[3] and Simon Kingham[3]

Table 4 Association between overweight, obesity, overweight+obesity and environmental factors adjusted for socio-demographic and other environmental factors

	Category 1	Category 2			Category 3			Category 4			Category 5			
NZdep	*Reference*	0.93	0.74,1.17	0.537	1.04	0.82,1.33	0.749	1.18	0.93,1.51	0.177	**1.56**	**1.20,2.04**	**0.001**	**0.001**
Greenspace	*Reference*	1.00	0.79,1.26	0.521	0.97	0.77,1.22	0.797	**1.30**	**1.02,1.65**	**0.032**	**1.42**	**1.08,1.87**	**0.012**	**0.007**
Foodshop	*Reference*	**0.75**	**0.61,0.94**	**0.010**	0.90	0.73,1.12	0.343	0.79	0.61,1.04	0.088	**0.67**	**0.45,0.99**	**0.046**	0.137
Gym/pool	*Reference*	0.91	0.74,1.12	0.375	1.23	0.98,1.55	0.073	0.94	0.68,1.30	0.704	1.18	0.83,1.68	0.365	0.143
Active travel	*Reference*	1.15	0.90,1.48	0.269	1.16	0.88,1.54	0.291	1.10	0.84,1.46	0.485	0.90	0.67,1.21	0.497	0.314
Overweight+obesity														
Urban/rural	*Reference*	0.93	0.74,1.18	0.575	1.13	0.82,1.56	0.460	1.15	0.80,1.65	0.463				0.525
NZdep	*Reference*	1.09	0.91,1.31	0.328	1.06	0.88,1.28	0.547	1.17	0.97,1.42	0.109	**1.43**	**1.14,1.78**	**0.002**	**0.004**
Greenspace	*Reference*	**1.23**	**1.03,1.47**	**0.023**	1.08	0.90,1.29	0.433	**1.34**	**1.11,1.61**	**0.002**	**1.39**	**1.10,1.75**	**0.006**	**0.005**
Foodshop	*Reference*	0.88	0.74,1.04	0.128	0.94	0.79,1.11	0.437	0.92	0.74,1.14	0.444	0.74	0.53,1.03	0.079	0.320
Gym/pool	*Reference*	0.96	0.81,1.14	0.675	1.11	0.93,1.33	0.247	1.07	0.83,1.37	0.598	1.11	0.84,1.48	0.455	0.217
Active travel	*Reference*	1.09	0.89,1.32	0.401	1.12	0.90,1.39	0.313	1.10	0.89,1.36	0.379	0.91	0.73,1.15	0.428	0.315

Note: Categories: Urban/rural: 1 = Main urban area; 2 = Secondary urban area; 3= Minor urban area; and 4 = Rural area.
Environmental variables: quintiles (1 = best access, 5 = worst access); Deprivation (NZdep) (1= least deprived, 5= most deprived).
All bolded values are statistically significant at the 0.05 level.

RESULTS: We found that increased neighbourhood deprivation and decreased access to neighbourhood greenspace were both significantly associated with increased odds of overweight and/or obesity.

Accessibility of food outlets

Accessibility of sports/leisure facilities

Percentage active transport to work

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Transport

Greenspace

PUBLIC HEALTH 127 (2013) 1005–1011

Available online at www.sciencedirect.com

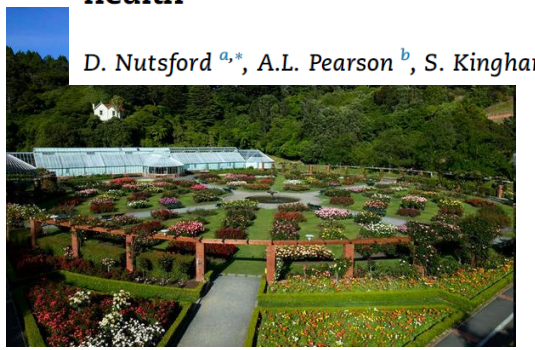
Public Health

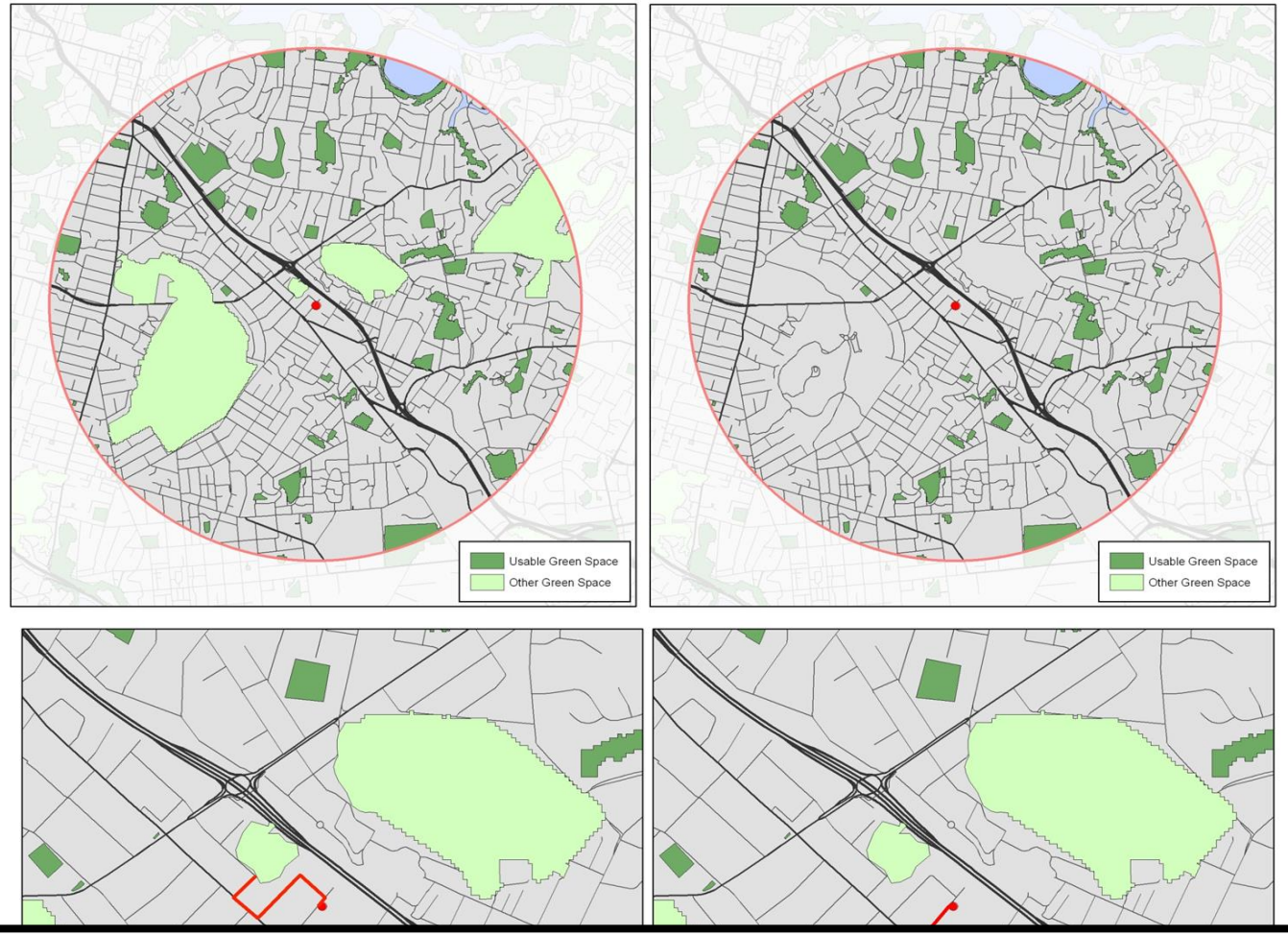
journal homepage: www.elsevier.com/puhe

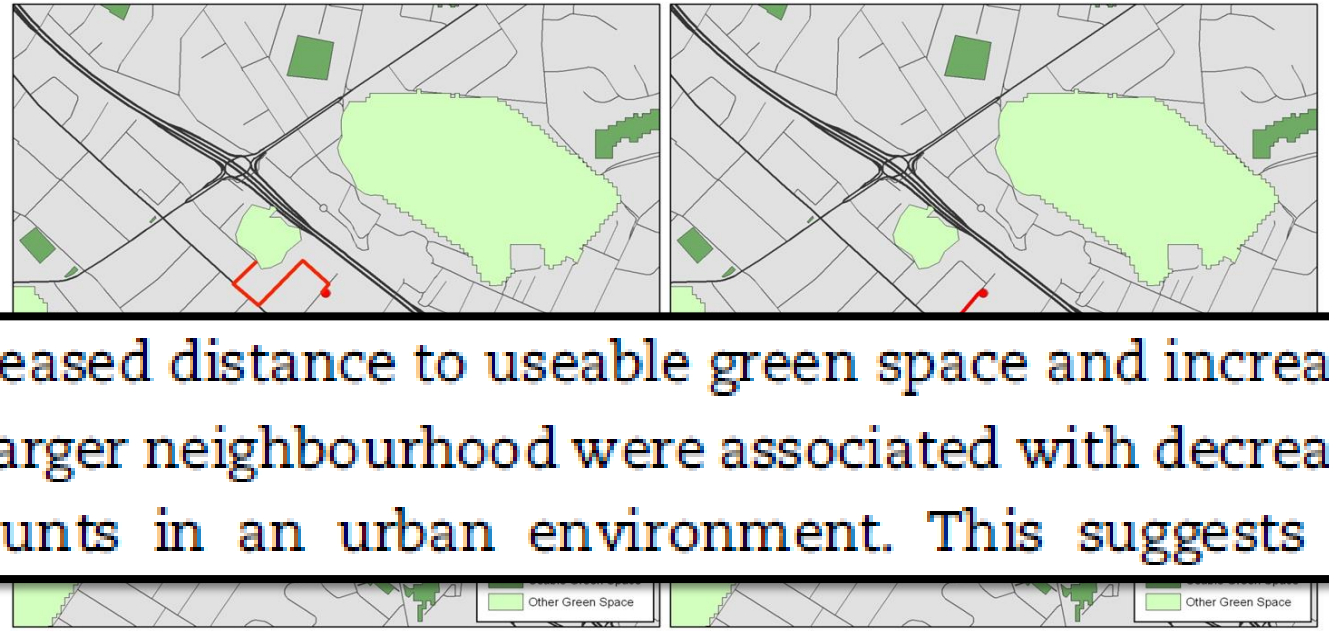
Original Research

An ecological study investigating the association between access to urban green space and mental health

D. Nutsford [a,*], A.L. Pearson [b], S. Kingham [a]







Conclusion: This study found that decreased distance to useable green space and increased proportion of green space within the larger neighbourhood were associated with decreased anxiety/mood disorder treatment counts in an urban environment. This suggests the

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Bluespace

port

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Bluespace

Health & Place 39 (2016) 70–78

Contents lists available at ScienceDirect

Health & Place

journal homepage: www.elsevier.com/locate/healthplace

Residential exposure to visible blue space (but not green space) associated with lower psychological distress in a capital city

Daniel Nutsford [a], Amber L. Pearson [b,c,*], Simon Kingham [a], Femke Reitsma [a]

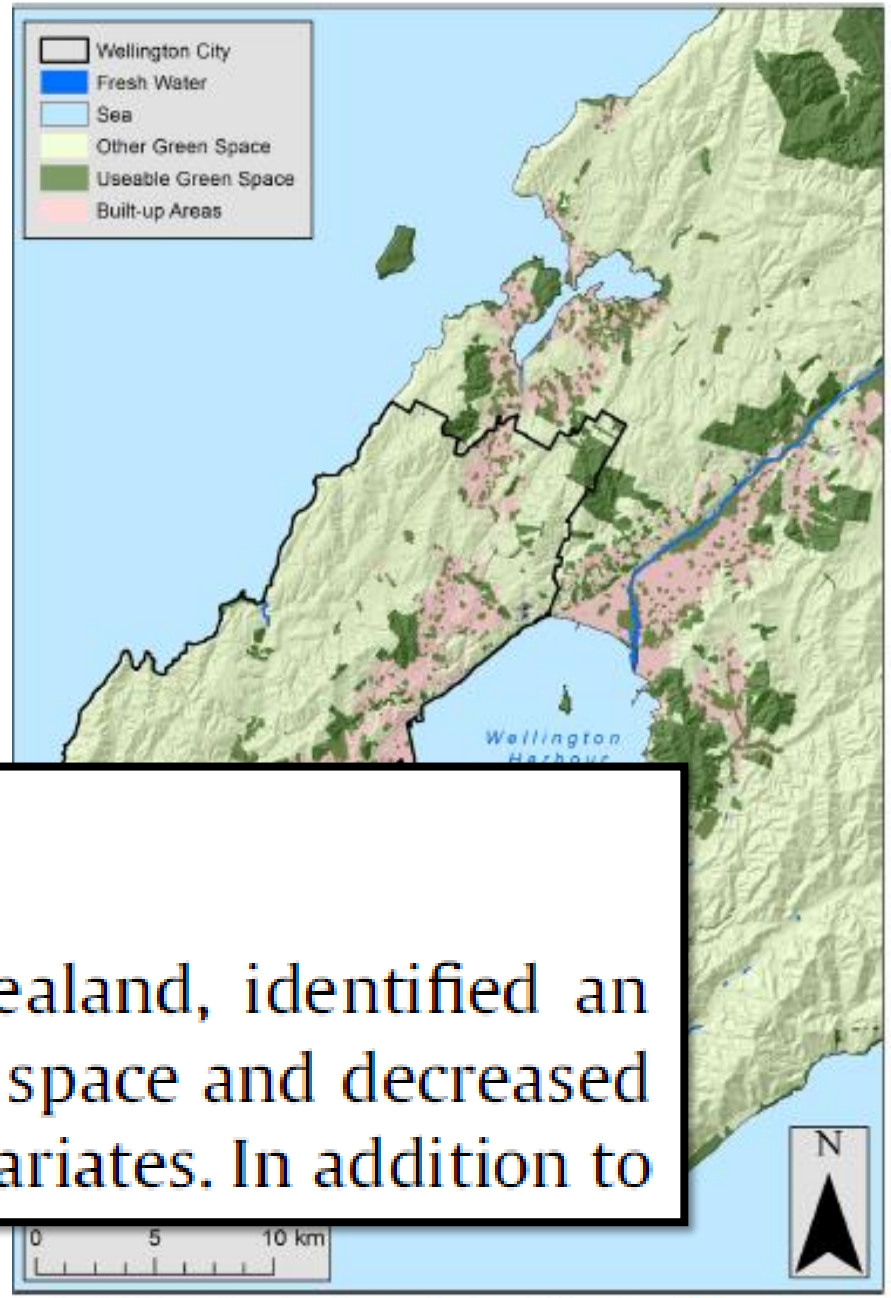

Fig. 1. Distribution of natural environments throughout Wellington City and the greater region.

5. Conclusion

This study, in the capital city of New Zealand, identified an association between increased views of blue space and decreased psychological distress while adjusting for covariates. In addition to

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People like being happy

- And having fun

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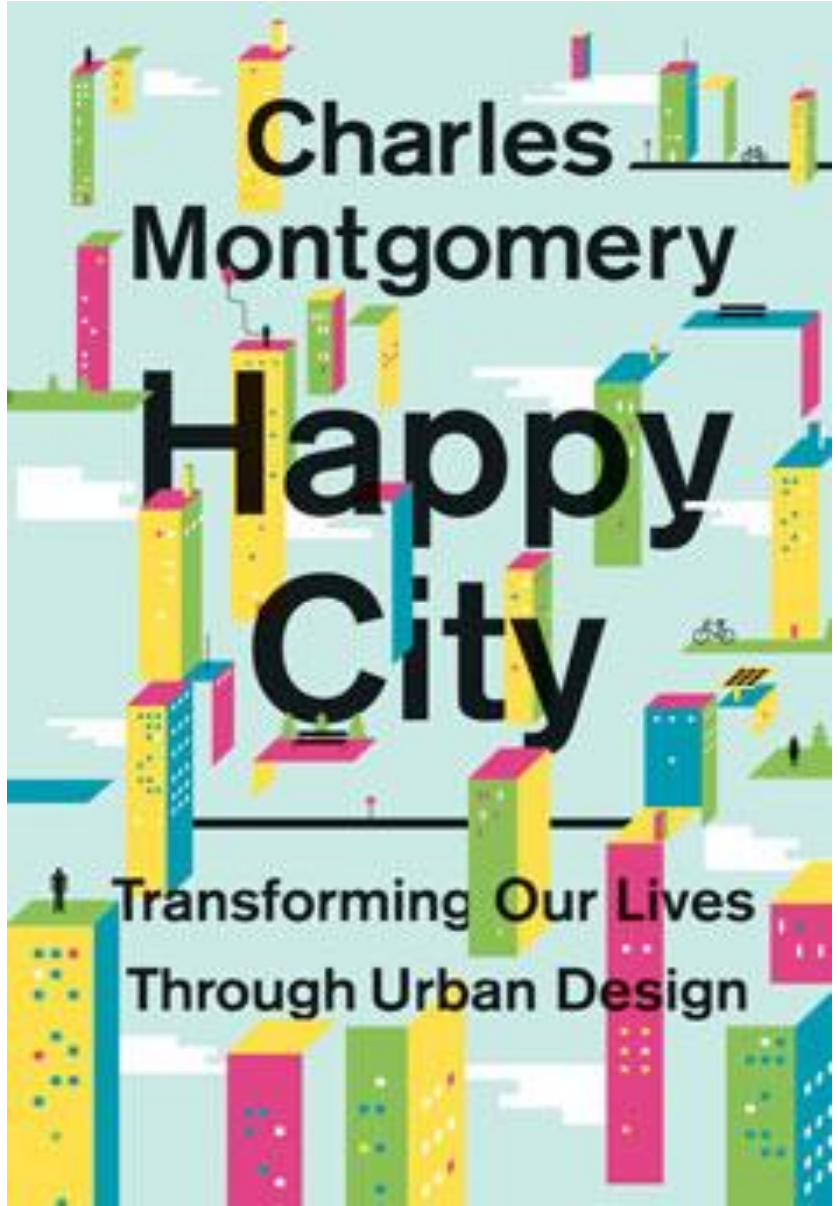
Happiness



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Cities
Resilient cities

Cities with physically active residents more productive as well as healthier

Increasing amount of green space and promoting walking, cycling and use of public transport has significant economic benefits, study concludes

Peter Walker

@peterwalker99

Tuesday 9 June 2015

Housing

Inner-city living makes for healthier, happier people, study finds

Residents of higher-density areas are more active, more socially engaged – and less obese – than people who live in the sprawl of suburbia

5273 1,194

Reuters

Friday 6 October 2017
01.13 BST

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https://www.theguardian.com/society/2017/oct/06/inner-city-living-makes-for-healthier-happier-people-study-finds

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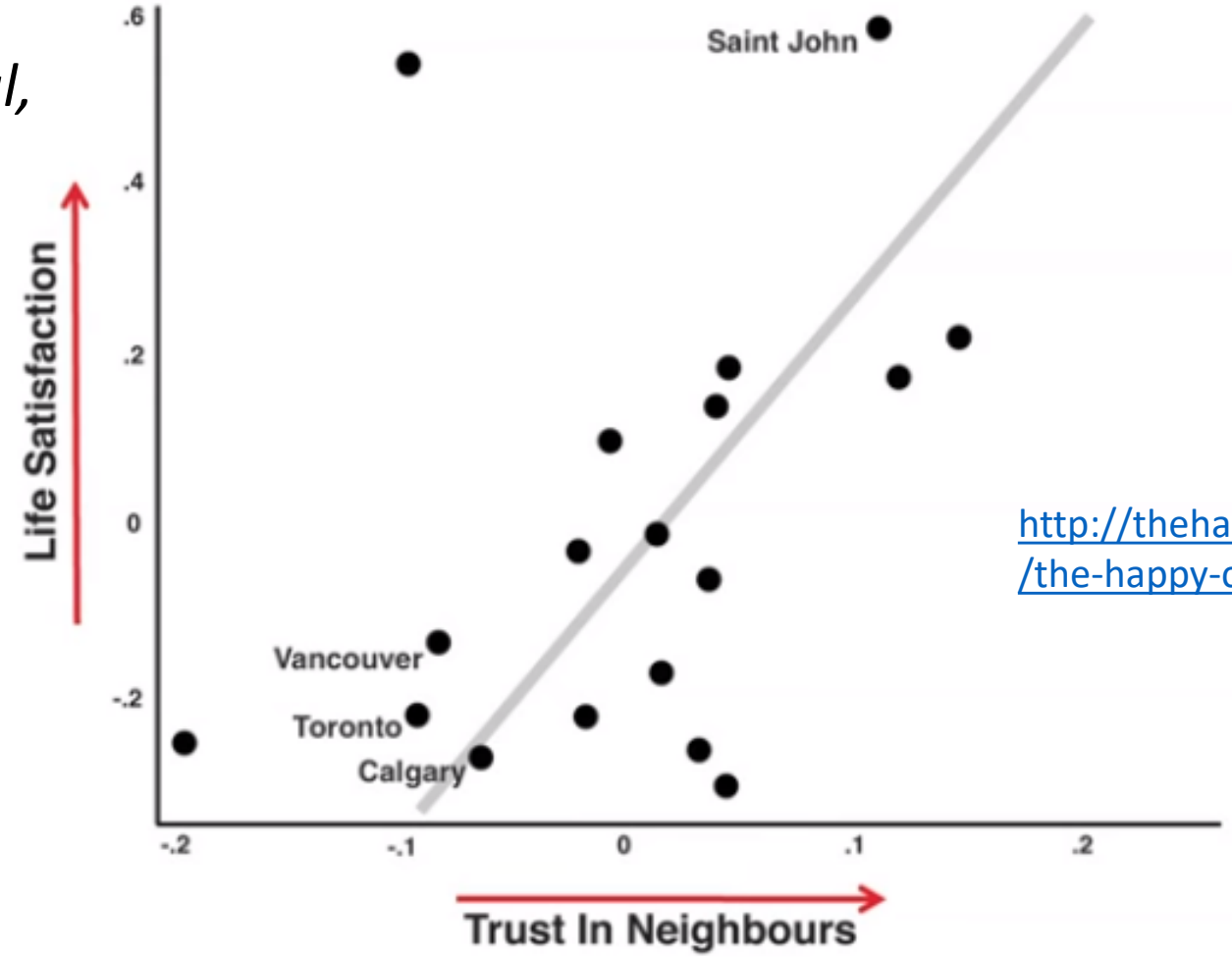
trusting cities = happier cities

"People who live in monofunctional, car-dependent neighborhoods outside of urban centers are much less trusting of other people than people who live in walkable neighborhoods where housing is mixed with shops, services, and places to work."
- Happy City



courtesy John F Helliwell

http://thehappycity.com/project/the-happy-city-experiment/

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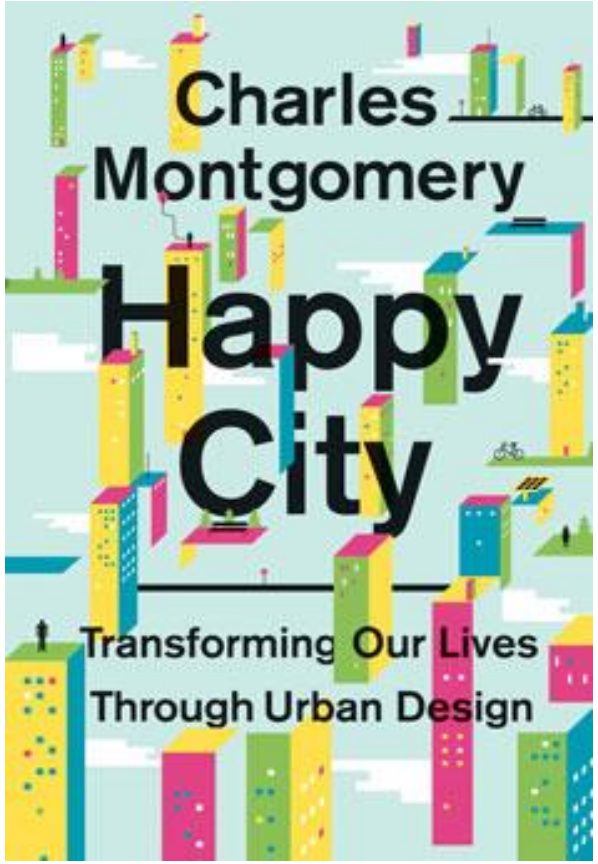
Happy Cities

- *psychotic disorders, including schizophrenia, are most common in neighbourhoods with the thinnest social networks*
- *the more connected we are with family and community, the less likely we are to experience colds, heart attacks, strokes, cancer and depression*
- *connected people sleep better at night. They are more able to tackle adversity. They live longer. They consistently report being happier*
- *low-density sprawl puts residents at greater risk of arthritis, chronic lung disease, digestive problems, headaches & urinary tract infections*



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Happy Cities have…

- Diversity of housing types
- Low or no fences
- Green (and blue) space
- Close proximity to facilities e.g. schools, shops, job
- Good public transport
- Low volume / slow speed traffic
- Physical *activityable* (walk, bike) environments/infrastructure

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But some of this is difficult to measure/model !

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Challenges

- Climate change
- Energy use
- Pollution
- Congestion
- Physical activity / Obesity
- Community severance
- Inequality

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Charging differently

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Charging externalities

Currently

- 50% Fuel Excise Duty (FED)
- 50% Road User Charges (RUC)

Future?

- 100% electronic Road User Charges (eRUC)

Issues with FED …

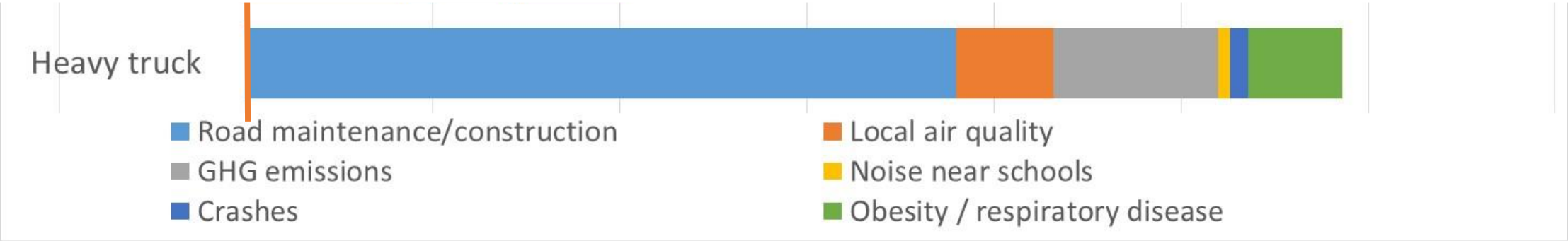
We price every kilometre on the network at the same rate

- *Direct costs of use*
  - some roads cost more than others to build
  - wear and tear impacts on some roads is different than others (e.g. logging truck on unsealed road vs new SH)
- *Indirect costs of use*
  - congestion
  - other externalities which are specific to time, location or both including GHGs
- Specific / local charging is difficult and expensive
  - current tolling system expensive to run
  - revenue-raising for local government is cumbersome and leaky (regional fuel tax)

Directed cost-based funding / hypothecation

Cost per km

Note: completely made up figures. For illustrative purposes only.



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Charge by route

- Route A - 100 kms

- Route B - 115 kms

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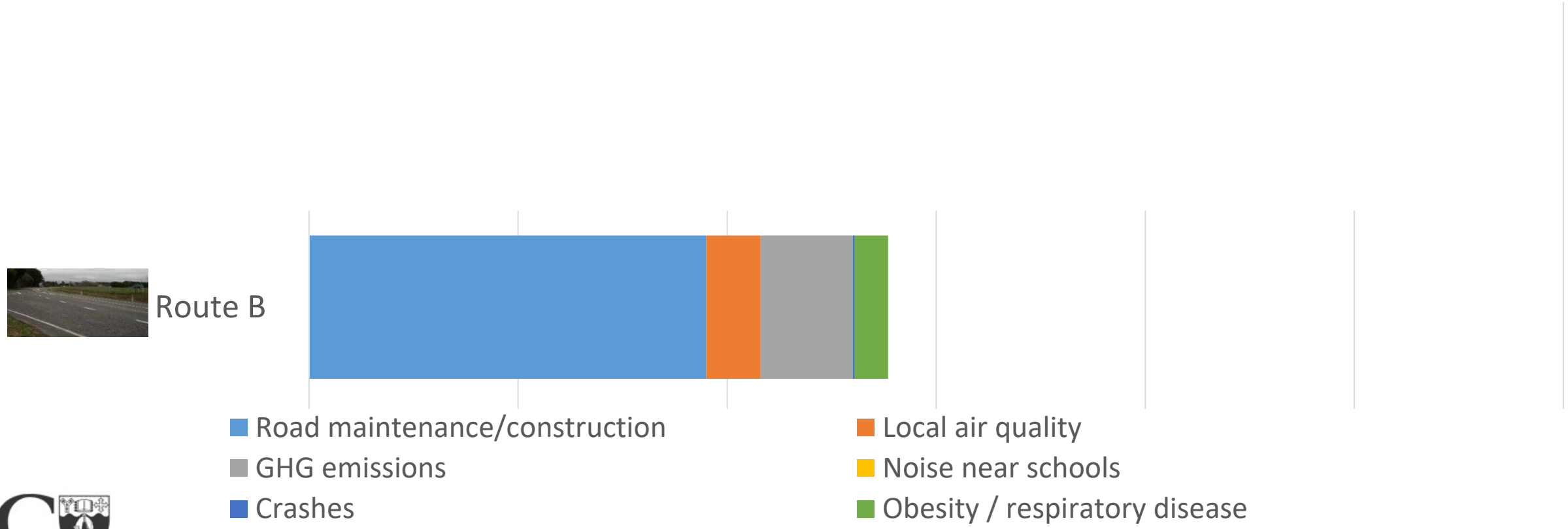
Directed cost-based funding / hypothecation – by route

Cost per km, by route

Note: completely made up figures. For illustrative purposes only.



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eRUC

- Manage behaviour / mode choice / route
- Charge for environmental ‘damage’
- Charge for health impact
- Charge by time and place

Conclusions

- Human behaviour is not easy to predict
  - And therefore model
- Some wellbeing outcomes are not easily quantifiable
  - Community cohesion’
  - Community resilience
  - Mental wellbeing
- Important to understand the *difficult-to-measure*
  - and account for

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